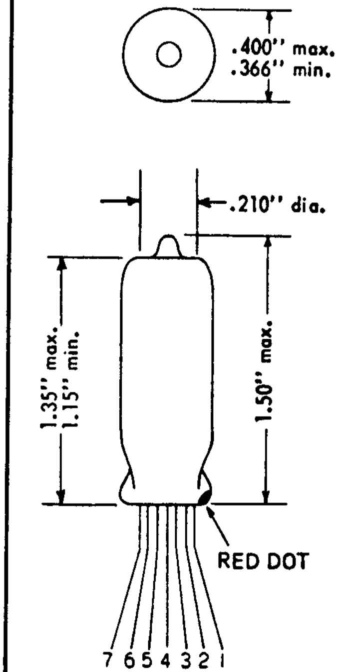
TYPE CK5702WB

Excellence in Electronics

The CK5702WB is a heater – cathode type sharp – cutoff pentode of subminiature construction capable of operation in the VHF region. This tube is characterized by long life and stable performance. It is designed for service where severe conditions of high temperature and mechanical shock or vibration are encountered. A separate terminal connection is provided for Grid #3, which under self – bias conditions can be connected directly to ground, permitting the cathode by – pass capacitor to be omitted for lower grid loading. The flexible terminal leads may be soldered or welded directly to the terminals of circuit components without the use of sockets. Standard inline subminiature sockets may be used by cutting the leads to a suitable length.



MECHANICAL DATA

ENVELOPE: T – 3 Glass

BASE: None (0.016" tinned flexible leads. Length: 1.5" min. Spacing: 0.048" center – to – center)

TERMINAL CONNECTIONS: (Red *Dot is adjacent to lead 1)*

Lead 1 Plate	Lead 5 Grid #3
Lead 2 Grid #2	Lead 6 Cathode
Lead 3 Heater	Lead 7 Grid #1
Lead 4 Heater	

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock Test – Note 3)	450 G
Maximum Uniform Acceleration (Centrifuge Test – Note 4)	1000 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test – Note 5)	2.5 G
Maximum Bulb Temperature	220 °C

MOUNTING POSITION: Any

ELECTRICAL DATA

CAUTION – To Electronic Equipment Design Engineers: Special attention should be given to the temperatures at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Both reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

RATINGS AND NORMAL OPERATION:	MIL – E – 1 SYMBOL	DESIGN MINIMUM	NORMAL TEST CONDITIONS (Note 7)	NORMAL OPERATION (Note 6)	DESIGN MAXIMUM	MIL – E – 1 UNITS
Heater Voltage (Note 8)	Ef:	5.7	6.3	6.3	6.9	V
Plate Voltage	Eb:	....	120	120	165	Vdc
Grid #1 Voltage	Ec1:	–55	0	0	....	Vdc
Grid #2 Voltage	Ec2:	....	120	120	155	Vdc
Grid #3 Voltage	Ec3:	....	0	0	0	Vdc
Plate Dissipation	Pp:	....	....	0.9	1.10	W
Grid #2 Dissipation	Pg2:	....	....	0.3	0.40	W
Grid #1 Circuit Resistance	Rg1:	....	....	1.0	1.2	Meg.
Heater – Cathode Voltage	Ehk:	–200	....	100	+200	v
Cathode Current	Ik:	....	....	....	16.5	mAdc
Cathode Resistance	Rk:	....	200	200	....	ohms
Plate Current (1)	Ib (1):	....	....	7.5	....	mAdc
Grid #2 Current	Ic2:	....	....	2.6	....	mAdc
Transconductance (1)	Sm (1):	....	....	5000	....	µmhos
Plate Resistance	rp:	....	....	0.34	....	Meg.

Tentative Data

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS PART 1			Combined AQL = 1.0% excluding Mechanical and Inoperatives							
Heater Current:		0.65	If:	190	----	200	----	210	----	mA
Heater – Cathode Leakage:	Ehk = +100 Vdc	0.65	Ihk:	----	----	----	----	5	----	μAdc
	Ehk = –100 Vdc		Ihk:	----	----	----	----	5	----	μAdc
Grid Current (1):		0.65	Ic1 (1):	----	----	----	----	–0.1	----	μAdc
Plate Current (1):		0.65	Ib (1):	5.5	6.9	7.5	8.1	9.5	2.3	mAdc
Plate Current (2):	Ec1 = –9.0 Vdc	0.65	Ib (2):	----	----	----	----	50	----	μAdc
Screen Current:		0.65	Ic2:	1.7	----	2.6	----	3.5	----	mAdc
Transconductance (1):		0.65	Sm (1):	4200	4775	5000	5225	5800	860	μmhos
Continuity and Shorts (Inoperatives):		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope (8-7) (Note 10)									
MEASUREMENTS ACCEPTANCE TEST PART 2										
Insulation of Electrodes:	Ef = 6.3 V; Eg-all = –100 Vdc	2.5	Rg1-all:	250	----	----	----	----	----	Meg.
	Ep-all = –300 Vdc		Rp-all:	250	----	----	----	----	----	Meg.
Transconductance (2):	Ef = 5.7 V (Note 9)	2.5	Δ_{Ef} Sm(2):	----	----	----	----	5	----	%
Grid Emission:	Ef = 7.5 V; preheat 5 minutes at Ec1 = 0; Test at Ec1 = –10 Vdc	6.5	Ic(2):	----	----	----	----	–0.5	----	μAdc
AF Noise:	Esig = 70 mVac; Ec2 = 25 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 ohms; Rp = 0.2 Meg; Ck = 1000 μf; Rk = 4000 ohms.	2.5	EB:	----	----	----	----	17	----	VU
Plate Resistance:		6.5	rp:	0.15	----	----	----	----	----	Meg.
Capacitance:	(Note 2)	6.5	Cgp:	----	----	----	----	0.03	----	μμf
Capacitance:			Cin:	4.1	----	----	----	5.5	----	μμf
Capacitance:			Cout:	2.9	----	----	----	4.1	----	μμf
Low Pressure Voltage Breakdown:	Pressure = 55 ± 5 mm Hg; Voltage = 300 Vac	6.5	----	----	----	----	----	----	----	----
Operation Time:	(Note 11)	4.0	t:	----	----	----	----	20	----	sec.
Vibration (2):	F = 40 cps; G = 15; Rp = 10,000 ohms	2.5	Ep:	----	----	----	----	50	----	mVac
Vibration (3):	F = 30 – 1000 cps; G = 15; Rp = 10,000 ohms; t = 3 minutes; positions X_1 and X_2 only	4.0	Ep:	----	----	----	----	240 peak to peak	----	mv
DEGRADATION RATE ACCEPTANCE TESTS										
Subminiature Lead Fatigue:		2.5	----	4.0	----	----	----	----	----	arcs
Shock (1):	Ehk = +100 Vdc; Rg = 0.1 Meg. Hammer Angle = 30° (Note 3)	20	----	----	----	----	----	----	----	----
Fatigue (1):	96 hours; G = 2.5; Fixed frequency; F = 25 min. 60 max. (Note 5)	6.5	----	----	----	----	----	----	----	----
Fatigue (2):	6 hours; G = 10; Fixed frequency; F = 25 min, 60 max. (Note 12)	----	----	----	----	----	----	----	----	----
Post Shock (1) and Fatigue Tests (1) and (2) End points:										
Vibration (2):	F = 40 cps; G = 15; Rp = 10,000 ohms	----	Ep:	----	----	----	----	75	----	mVac

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RELIABLE SUBMINIATURE PENTODE

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
DEGRADATION RATE ACCEPTANCE TESTS (cont'd)								
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc	---- ----	Ihk: Ihk:	---- ----	10 10	μAdc μAdc		
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	Δ_t Sm(1):	----	10	%		
Grid Current (1):		----	Ic(1):	----	−1.0	μAdc		
Shock (2):	Ehk=+100 Vdc; Rg=0.1 Meg.; G=75; (hammer angle=120°+rubber pad); t=10 milliseconds duration (note 13)	----	----	----	----	----		
Post Shock Test (2) End Points:								
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	----	Ep:	----	75	mVac		
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc	---- ----	Ihk: Ihk:	---- ----	10 10	μAdc μAdc		
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	Δ_t Sm(1):	----	10	%		
Grid Current (1):		----	Ic(1):	----	−1.0	μAdc		
Glass Strain (Thermal Shock):		6.5	----	----	----	----		
ACCEPTANCE LIFE TESTS								
Heater Cycle:	Ef=7.5 V; Eb=Ec1=Ec2=Ec3=0 V; Ehk=140 Vac; 1 min. on, 1 min. off.	1.0	----	2000	----	cycles		
Heater Cycling Life Test End Points:								
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc	---- ----	Ihk: Ihk:	---- ----	20 20	μAdc μAdc		
1 Hour Stability Life Test:	TA=room; Ehk=+200 Vdc; Rg1=1.0 Meg.	----	----	----	----	----		
1 Hour Stability Life Test End Points:								
Change in Transconductance (1) of individual tubes:	(Typical sample size=50 tubes)	1.0	Δ_t Sm(1):	----	10	%		
100 Hour Survival Rate Life Test:	TA=room; Ehk=+200 Vdc; Rg1=1.0 Meg.	----	----	----	----	----		
100 Hour Survival Rate Life Test End Points:	(Typical sample size=200 tubes)	----	----	----	----	----		
Inoperatives:		0.65	----	----	----	----		
Transconductance (1):		1.0	Sm(1):	3800	----	μmhos		
Intermittent High Temperature Life Tests:	T Bulb=220°C; Ehk=+200 Vdc; Rg1=1.0 Meg.	----	----	----	----	----		
500 Hour Intermittent High Temperature Life Test End Points:	(Typical sample size=20 tubes 1st sample 40 tubes 2nd sample)	----	----	----	----	----		
Inoperatives:		----	----	----	----	----	1	3
Grid Current (1):		----	Ic(1):	----	−0.5	μAdc	1	3
Heater Current:		----	If:	180	220	mA	1	3
Change in transconductance (1) of individual tubes:		----	Δ_t Sm(1):	----	20	%	1	3

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)(cont')

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
ACCEPTANCE LIFE TESTS (cont'd)								
Transconductance (2):	(Note 9)	....	Δ_{Ef}Sm (2):	....	15	%	2	5
Heater-Cathode Leakage:	Ehk=+100 Vdc	....	Ihk:	....	10	µAdc	2	5
	Ehk=−100 Vdc	....	Ihk:	....	10	µAdc		
Insulation of Electrodes: g1−all		....	Rg1−all:	50	....	Meg.	2	5
p−all		....	Rp−all:	50	....	Meg.		
Transconductance (1) Average Change:		....	Avg.Δ_tSm (1):	....	15	%	...	...
Total Defectives:		....	....	....	....	....	4	8
1000 Hour Intermittent High Temperature Life Test End Points:	(Typical Sample Size= 20 tubes 1st sample 40 tubes 2nd sample)	....	....	....	....	....	...	...
Inoperatives:		....	....	....	....	....	2	5
Grid Current (1):		....	Ic (1):	....	−1.0	µAdc	2	5
Heater Current:		....	If:	177	223	mA	2	5
Change in transconductance (1) of individual tubes:		....	Δ_tSm(1):	....	30	%	2	5
Heater−Cathode Leakage:	Ehk=+100 Vdc	....	Ihk:	....	15	µAdc	2	5
	Ehk=−100 Vdc	....	Ihk:	....	15	µAdc		
Total Defectives		....	....	....	....	....	5	10

NOTES

Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1 "Inspection Instructions for Electron Tubes" and MIL-STD-105A.

Note 2: With a cylindrical shield (0.405" I.D.−1 7/8" long) connected to lead 6.

Note 3: Test conditions and acceptance criteria per Shock Test Procedures of MIL-E-1 basic specification.

Note 4: Centrifuge Test with forces applied in any direction.

Note 5: Test conditions and acceptance criteria per Fatigue Test Procedures of MIL-E-1 basic specifications.

Note 6: These normal values represent conditions at which control of reliability may be expected.

Note 7: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.

Note 8: For most applications the performance will not be adversely affected by ±10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

Note 9: Change of transconductance for individual tubes from that value measured at Ef=6.3 V to that value measured at Ef=5.7V.

Note 10: In addition to meeting the tightened electrical, physical and mechanical tests described in this data sheet Raytheon Reliable Tubes are now guaranteed to be free from "potential" defects identifiable by microscopic inspection as described by appendix B of "Inspection Instructions for Electron Tubes."

Note 11: Operation time is the time in seconds required for the plate current to attain a value within plus or minus 10 percent of the three minute plate current (1) value using a cold tube. No preheating before this test will be allowed.

Note 12: The tubes shall be rigidly mounted on a table vibrating with simple harmonic motion. The tubes shall be vibrated for a total of 6 hours, 2 hours in each of three positions, X1, X2, and Y1. Only rated heater voltage shall be applied. Tubes which show one or more of the following defects shall be considered failures.

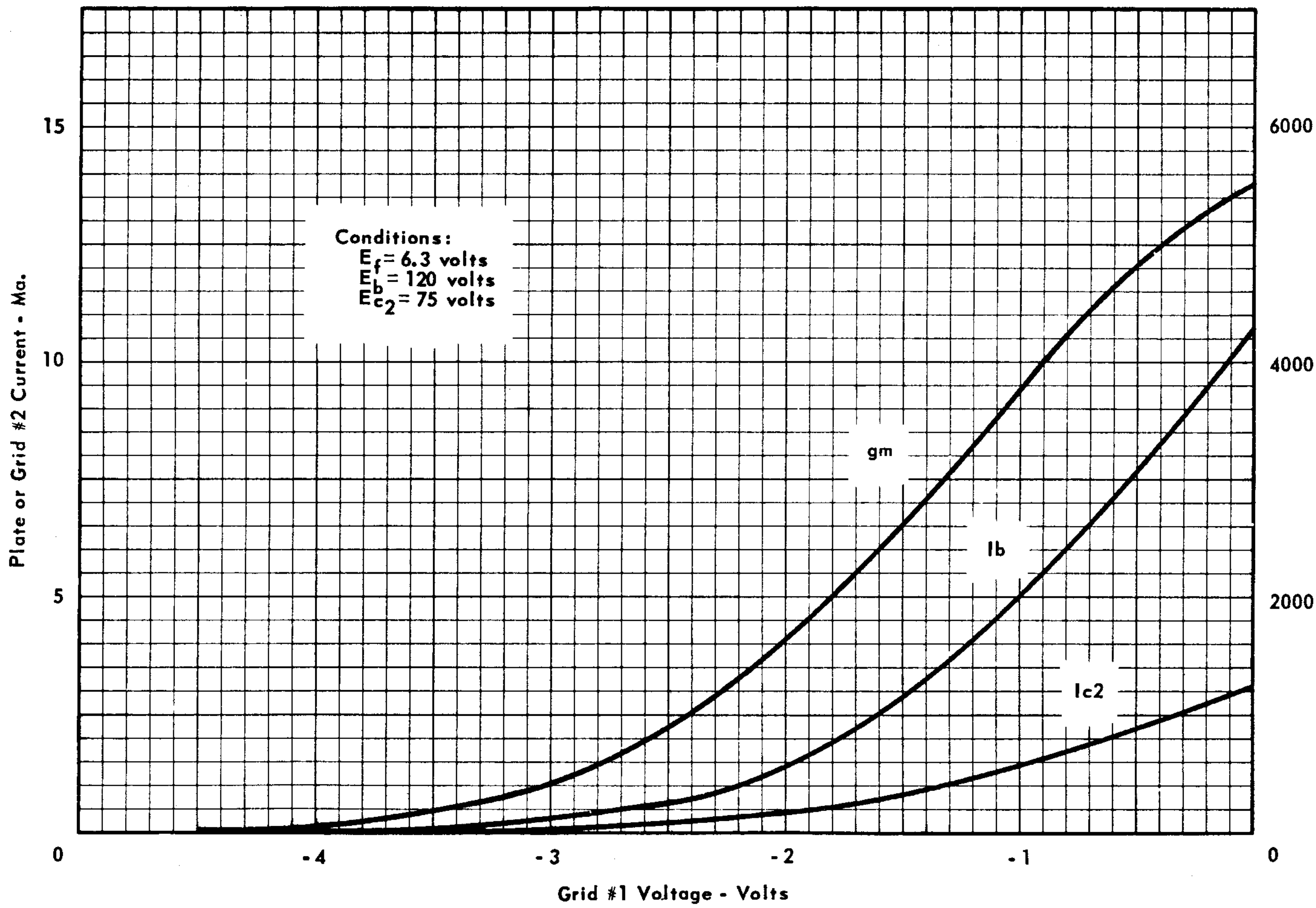
(a) Tubes which show permanent or tap shorts or open circuits following fatigue test, when tested as specified in 4.7.2 and 4.7.3.

(b) Tubes which do not comply with post fatigue limits. This is a destructive test.

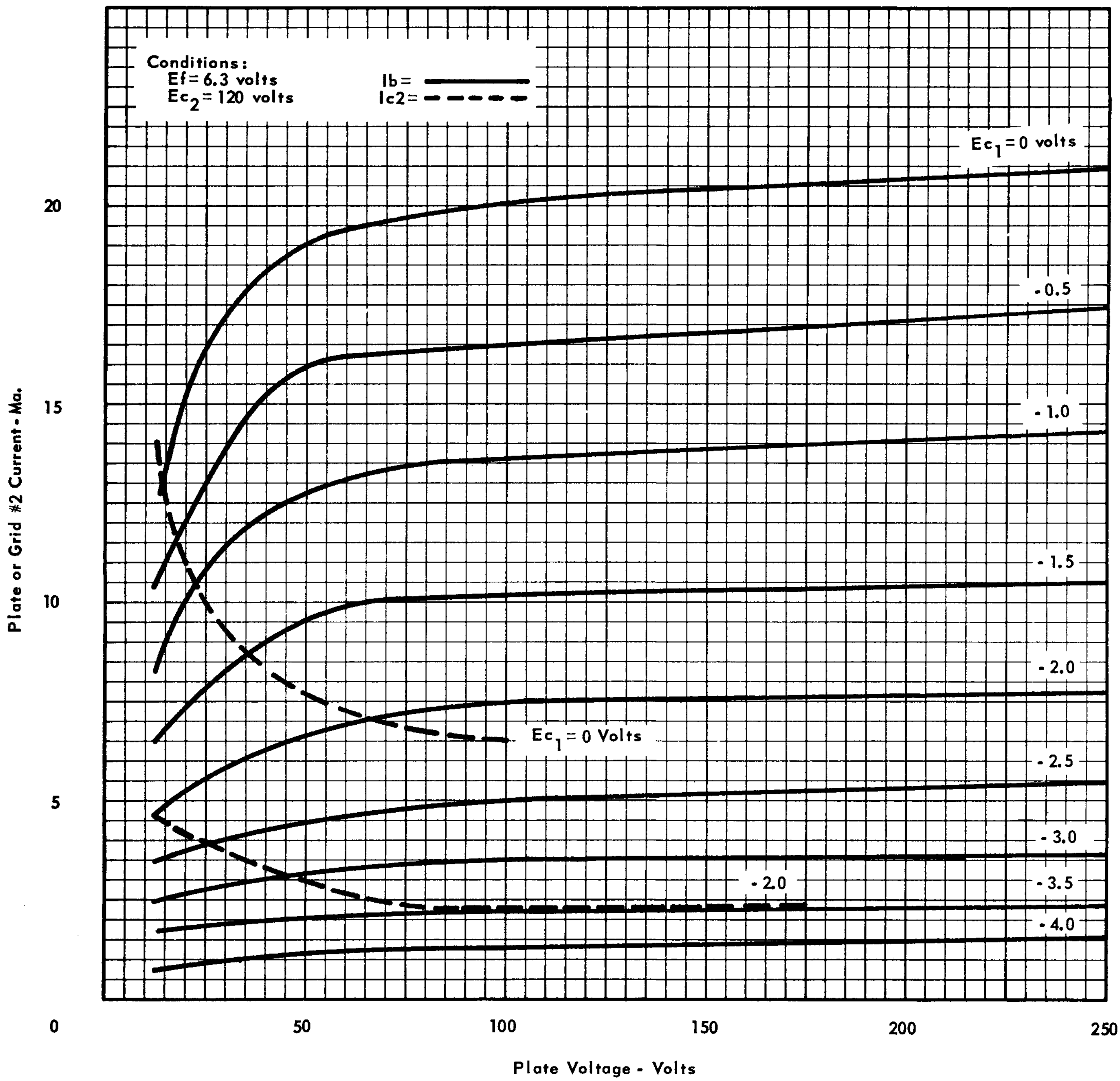
Note 13: The provisions of paragraph 4.9.20.5 of Specification MIL-E-1 shall apply, except for test conditions listed for shock test (2).

RELIABLE SUBMINIATURE PENTODE

AVERAGE CHARACTERISTICS



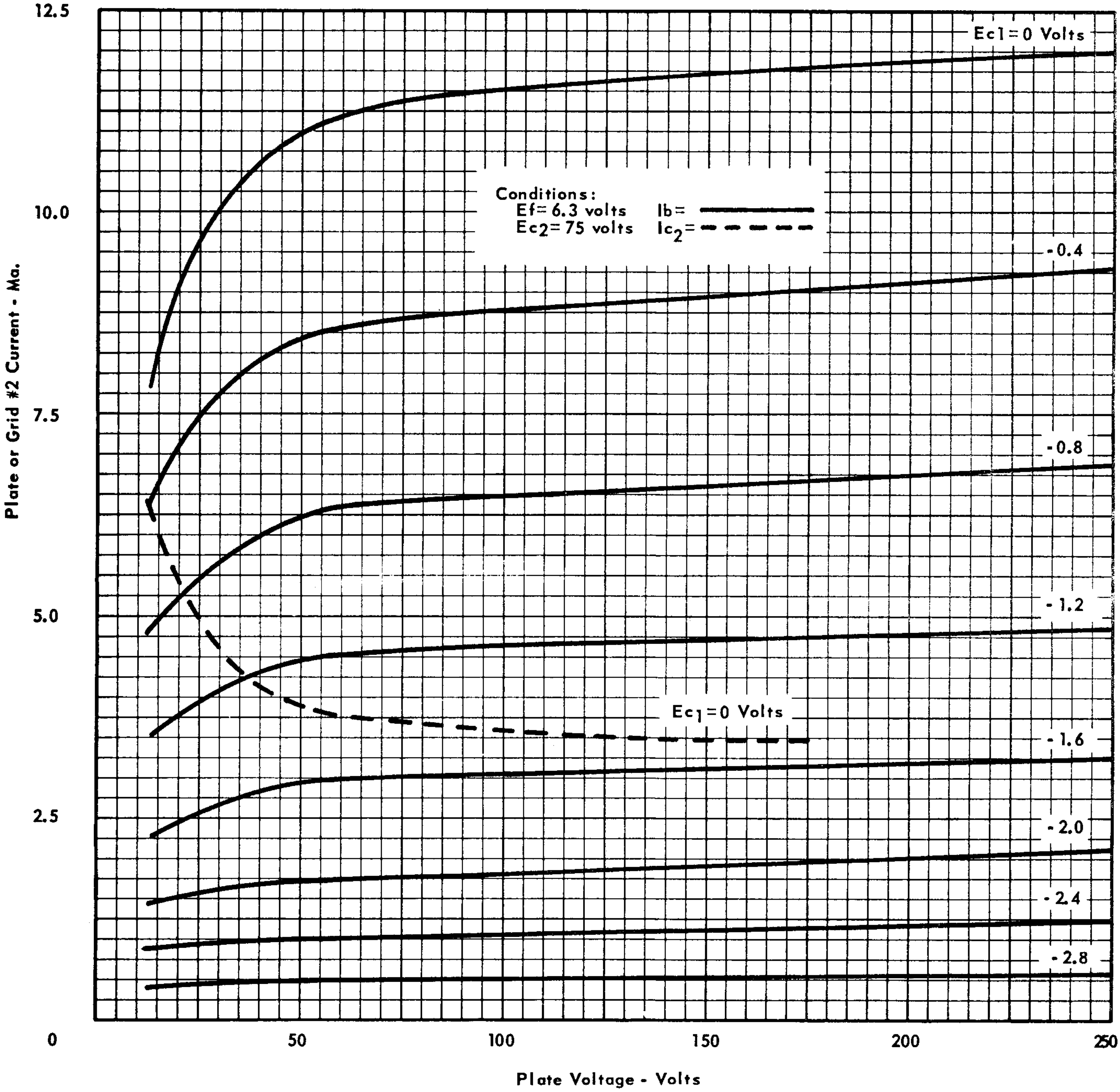
AVERAGE PLATE CHARACTERISTICS



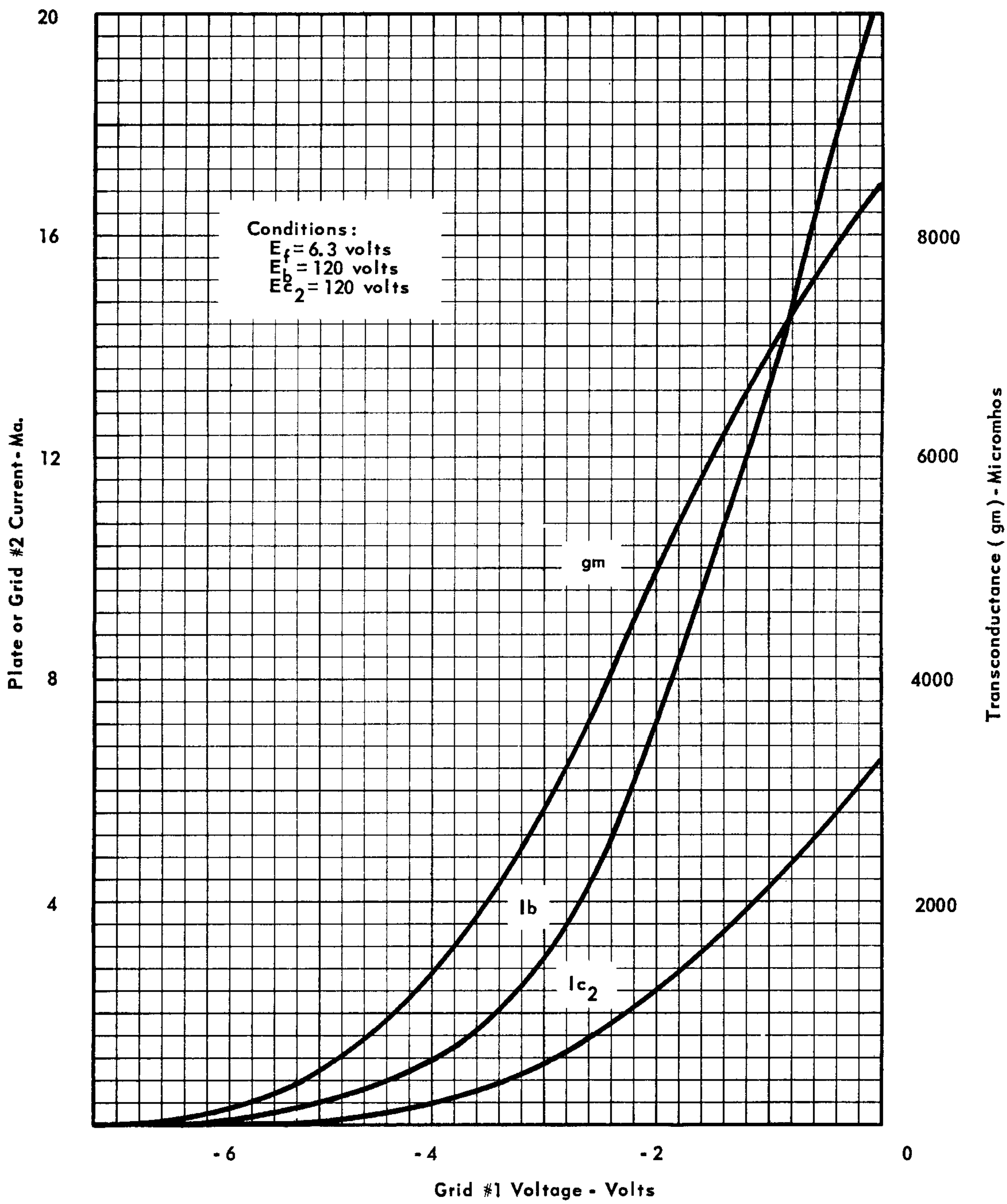
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RELIABLE SUBMINIATURE PENTODE

AVERAGE PLATE CHARACTERISTICS



AVERAGE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
Triode Connected

